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still require accurate elucidation; but the principles upon which a sound realism must approach the question seem capable of being determined. No realism will be finally satisfactory which excludes objective reality from *all* with which we are in immediate relation, and assigns it to a region which we can reach only by inference or other indirect process. Nor does it seem impossible to assert that part, at least, of that with which the knower comes into direct and immediate relation is itself the objectively and finally real.

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CONCEPTS AND EXISTENCE

PROFESSOR PITKIN'S clear and excellent article on "The Empirical Status of Geometrical Concepts"[1] introduces a theme of exceptional interest, and is a helpful contribution to its discussion. Instead of torturing possible minor points of difference, I much prefer to recognize a substantial measure of agreement, and to follow up in a casual way the line of suggestion that Professor Pitkin has initiated.

Mathematics has been quite long enough the ally of poetic and flesh-averting metaphysics. The claim that the propositions and concepts of geometry are blessed *νούμενα*, noused things, having nothing to do with sensed things, except the task of redeeming them, has been growing quietly antiquated. Nevertheless, a certain mystery remained. It is well, certainly, to fill up the gulf between noused things and sensed things on the side of perceptibility, but this, I fear, will not pacify the unhappy ghost, for what I may call the despiritualization of geometry suggests that the real problem is that of the existential status of universals. If mathematics has had many a message for theology, has it not one now for realism? Let the noused things be not exclusively *νούμενα*, but let them be also, or at least some of them, sensed things; the more important, the originally Platonic, distinction remains, the distinction, namely, between a universal and an individual.

The history of philosophy shows nothing more curiously characteristic than the determination, century after century, to minimize the authority of sense-perception, and nothing is more readily intelligible than this apparent perversity. Any one who seeks to prove that the things we empirically observe are not "really" what we empirically observe them to be, must begin by discrediting our natural organs of observation. The spirit of apologetics, conscious or unconscious, that has inspired so much of European philosophy demands the faith that eyes and ears are bad witnesses. If I would have you believe that the horn of an automobile is the flute of Marsyas or the lyre of Apollo, I must show you that our hearing is finite and committed to error. Plato had his own reasons, no doubt, for identifying the one and the many with the invisible and the visible, respectively, but the exaltation of what eludes perception in Plato's case and in the case of supernaturalism generally is no mystery. The philosophy of other-worldliness must needs be dialectical; it could not possibly be empirical. Geometry is also dialectical and the philosophy of it has been attracted to other-worldliness somewhat as words in Latin syntax are attracted into cases where they do not naturally belong. The point to notice, however, is that what gives to concepts their peculiar unity is not the circumstance that they are invisible, but the fact that they are *illustrated* to perception, as Professor Pitkin so well shows, as often as we assemble the material conditions that conform to what the definitions prescribe. Whenever we do so, however, the perceived object includes not less, but more than the definition. We can never see merely the concepts; the ridge of a distant roof seen against the sky may, to be sure, conform to the requirements of a straight line. So may the edges of many other things, and we can say without being misunderstood that we see a dozen instances of straight line or a dozen straight lines. The latter would probably be the more natural way of putting it; we should never, for instance, in natural conversation, say, "I see a dozen specimens of the genus horse": We should say, "I see a dozen horses." But whether it be straight lines or horses, what we observe is a repeating character. We certainly perceive individuals which are like one another in certain respects and different in others. Each individual comprises what we may call essence and accident, and I feel pretty confident that without the accident the essence will forever elude perception.

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[1] This JOURNAL, Vol. X, page 393.

Let the accident be the orange color of a roof otherwise red, in the light of a sunset. We may say it is the same as the color of a certain silk dress, or we may suddenly realize that it is just the color we want for some decorative purpose, and we may set out to match it. We are not, I suppose, seeking to duplicate a roof that looks thus and so under certain atmospheric conditions; we are using a natural power in a natural way, the power to prefer and to select. And we might, in the same way, select, *i. e.*, abstract, any other single feature that we can distinguish, such as a straight edge. Both the color, however, and the line, might have been discovered in different company, that is, the particular color is as unessential to the line as the line is to the color; each is accident with respect to the other. But each can be discovered by perception only in conjunction with *some* other. Now for those who have ceased to look to logic for the miracle of creation, and who admit that "eyes and ears," though leaving much to be desired, are all the witnesses we have as to what exists, and how, there will be no occasion to deny either of two things: first, that any specimen of existence is as complex as we observe it to be, and perhaps much more so; and secondly, that we can notice and isolate any single feature of a thing or things, making, thereby, an idea. Having selected it, its empirical company becomes material accident; its own concrete empirical status is irrelevant to the content of the selected abstraction; but are not the details of this empirical status, speaking somewhat awkwardly, the conditions of existence in the specific case? May we not say, and would it not be a truism, that existence is the empirical fund of accident which gives a selected property its empirical status?

One of the many good things Professor Bergson has said is that an idea becomes clear by being used. And the adequate definition of a straight line used by geometers is one that has been gradually reached. Is it likely that such a definition results from the desire to state what we see when we see a straight edge, or is the definition something to be used in geometrical operations, and something, the content of which has reference to its geometrical business?

Some confusion may lurk in the term "definition of a line." In geometry, the line *is* the definition, although in architecture it is a straight edge of structural matter. We speak of the plan of the roof, the lines of the roof, the system of lines, etc., but what is a definition doing with the preposition *of?* The selected property *of* a thing becomes an instrument in geometrical operations. Being made an idea, through separation from its existential accidents, and being handled as an instrument in certain technical operations, it is now defined in terms of its implications, for how else should any instrument be conceived?

It is not necessary to lay stress upon the instrumental character of geometrical concepts. I am chiefly interested in recalling that old-fashioned property of all concepts, their universal character as contrasted with the individual character of any particular incorporation. And yet, might we not expect that geometrical concepts would appear in a very different light to the one who pursues the path of research and discovery from what it does to the one who learns and perhaps teaches the mathematical conclusions of others? In other words, research and exposition, or discovery and demonstration, are two very different things. During research concepts are flexible, subject to the emphasis that the particular problems suggest. After the satisfactory termination of a particular inquiry, the concepts concerned are necessarily precise. Thus all those who are not original investigators easily get the impression of finality, an impression which those that make the science in question to progress are probably far from sharing.

In the presence of philosophical mysteries that have become classical it is frequently worth while to ask what the universe of discourse was in which a problem first appeared. The distinction between noused things and sensed things declared to involve permanence and unity for the one and mutability and multiplicity for the other, arose, as every one knows, as part of an argument for teleology. In this universe of discourse descriptions in terms of "the one and the many" are quite simple and intelligible. When, however, we abandon teleology, and carry the distinction over into the region of mere existence or fact, we may be *doing* something in an entirely proper way, but when we come to philosophize about it, we should begin by remembering what we have done.

Any one may, if he likes, marvel at the fact that nature so endlessly repeats itself. The repeating facts are what Poincaré has called the subject matter of science, and naturally enough, since it is only the fact that things happen again and can be made to happen again that makes it possible to understand how particular things happen. It is nature's repeating aspect that makes it possible to distinguish between the right way and the wrong way of doing anything, that makes it possible to learn anything by experience, that makes memory of any use and intelligence conceivable. Plant the best laboratory imaginable in a world where nothing ever happens as it has happened before; the laboratory will return to its ancestral dust before its occupants discover anything except the futility of research. Fortunately, however, we live in a world where an habitual behavior of things can be learned. We can diagnose situations more or less successfully according to our measure of acquaintance with the factors that contribute to make them. The repeating processes are equally well characterized whether we call them laws of God or laws of nature. Every repeating process, or that which is repeated, the repeating character, is a "one" established in nature, not a teleological "one," to be sure, but the type of "one" that underlies all actual purposive and reasonable behavior, as well as all scientific description. Here we have two types of "one," the "ones," the repeats that we discover in nature, and the "ones," the purposes of any one knowing and depending upon the former. The "ones" of the second or value class are, in a loose sense, functions of the "ones" of the first or the nature class, and the two classes may be symbolized by I_V and I_N, respectively. Now the type that the platonic philosophy was concerned with was I_V. As Santayana so well says, "Plato had no physics and the physics of Aristotle was false,"—false because Aristotle identified teleologically I_N with I_V. The tradition that concepts are noused and not sensed comes from a philosophy that made that proposition originally about I_V. It did not make it about such a property as is common to the line of the horizon (if we don't look at too much of it) and the flight of a bee. The singleness of direction is in each case a perceived property, no doubt; it is I_N. But now, isolating this property, and wishing to make it a feature of architectural constructions, how shall we describe it? It will not help us to say a straight line is a bee line. We must describe it after the *if—then* fashion. In any case we seek a formula, a concept for bringing a straight line into existence. When we have done so, we have another object which repeats the property common to the horizon and the bee's flight, and we can say that the formula for singleness of direction in the measurement of plane surfaces describes also the singleness of the bee's direction. Is there, however, no difference between the formula of a railroad curve and the curve of the track when laid down? It would be a little unusual to say we perceive the curve of a track that doesn't yet exist. The curve is, meanwhile, the plan of the engineer in charge of construction; it is an I_V.

Can this I_V be presented to perception? No doubt. We can load it with the necessary existential accidents. We can produce an individual according to its specifications.

This brings us back again to the emphasis upon universal and individual. If I_V is to be presented to perception at all it must be by virtue of *some* sort of construction or of natural process. If we are to construct a formula of the *if—then* type to describe the universal, must it not be one according to which the existential accidents must be distributed if they are to embody and render perceivable the concept in question? Must it not, *i. e.*, be a formula for construction, construction which may, of course, never be carried out?

To sum up: the concept is always less than what is perceived. As a selected property, existential specifications are irrelevant to it. If it happens to become an instrument useful in some particular class of operations, it will, as such, certainly be defined in terms of its implications, in terms of the *if—then* relation, and its status becomes dialectical. But that which now appears in a definition reached after many years of highly expert use is surely a different thing from the straight edge of a particular object. Rules for construction need not be identical with empirical descriptions of what is beheld after construction.

The ancient distinction between noused things and sensed things can not be made quite to disappear. It continues to be simple and intelligible in the universe of discourse that originally produced it. That which shall exist, though it does not yet do so, is invisible for the good reason that it does not yet exist.

The teleologist is under a dialectical obligation to say that his concepts are primarily noused things and not sensed things. The realist, if he banish empirical teleology from his universe of discourse would seem to be under an equally dialectical necessity of saying just the reverse.

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REVIEWS AND ABSTRACTS OF LITERATURE

The Fitness of the Environment: An Inquiry into the Biological Significance of the Properties of Matter. LAWRENCE J. HENDERSON. New York: The Macmillan Company. 1913. Pp. xi + 317.

"To what extent do the characteristics of matter and energy and the cosmic processes favor the existence of mechanisms which must be complex, highly regulated, and provided with suitable matter and energy as food? If it shall appear that the fitness of the environment to fulfill these demands of life is great, we may then ask whether it is so great that we can not reasonably assume it to be accidental, and finally we may inquire what manner of law is capable of explaining such fitness of the very nature of things" (p. 37). This is Professor Henderson's statement of his problem. The origin of the problem in the author's mind was the connection between physical and chemical properties of simple substances, and the organic functions which they serve. The key to the peculiar conditions of equilibrium between acids and bases in blood and protoplasm is to be found in certain characteristics of phosphate solutions and of similar solutions containing carbonic acid. Of all known substances, phosphoric acid and carbonic acid possess the greatest power of automatic regulation of neutrality.

"One does not like to accept a fact of such far-reaching importance as mere chance, and yet no other explanation was at hand. . . . Natural selection could not be involved. . . . But . . . this is no unique instance of a property of a simple substance automatically serving a very useful purpose in the processes of life.

"Then . . . came the realization of the reciprocal character of Darwinian fitness, and at once the whole difficulty was resolved."

After two chapters, one on "Fitness," the other on "The Environment," in which the nature of the problem and the proposed solution are discussed, the book takes a view of the essential physical and chemical constitution of the universe considered in its aspect as environment of life; this on the one hand; and, on the other, postulating certain essential characteristics of life, it interprets the mutuality of the fact of fitness between environment and life as genuine reciprocity or essential coimplication between them. The characteristics of life which are singled out as useful for the argument and at the same time as fundamental are these: life is a physico-chemical mechanism essentially complex in structure and function, durable (and therefore regular and regularly conditioned) and active (metabolic) (pp. 31, 32).

The physico-chemical characteristics of water, carbonic acid, and the